



Bently Nevada's Remote Service program for machinery management

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Increased global competition and deregulation are putting intense pressure on the Process and Power Generation industries to optimize plant processes, while reducing operating costs. Plants are being asked to increase the output, reliability, and availability of their processes and machinery, extend time between inspections and overhauls, while simultaneously reducing maintenance costs. This puts undue stress and strain on a plant's assets: its people and machinery. Remote Service programs, performed by Bently Nevada's Machinery Management Services (MMS) engineers, are designed to help our customers tackle these new business problems.

Remote Service program objectives

Provide technical support for plant personnel

Need to do more with less? Bently Nevada's MMS engineers can help. MMS engineers have years of proven expertise in solving rotating machinery problems *and* are experts at applying Bently Nevada



Tesoro Alaska Petroleum, on Alaska's Kenai peninsula, recently purchased a Bently Nevada Remote Service program for a critical compressor train.

machinery management products such as Data Manager® 2000 for Windows NT™ and Machine Condition Manager™ 2000.

Identify potential machinery problems early

Manage machinery in a proactive, rather than reactive, mode, before problems reach the alert level. Determine when a machine can continue to be run safely, and make the correct decisions when a malfunction may be serious enough to warrant a shutdown.

Provide Actionable Information quickly

Make the right decision in as short a time as possible. This can significantly impact revenue when a plant process is on the line. Why transport the expert to the job site when the data can be transported to the expert - in seconds? MMS

engineers are available around the clock to respond to emergencies.

Correlate process data with machinery condition data

Determine when and how the process can be adjusted to optimize both plant output and machinery asset life. Changes in a plant's process can have an adverse impact on machinery condition.

Remote Service program components

Get the Most From Data Manager 2000

The Data Manager 2000 for Windows NT system is central to our Remote Service program. It provides important tools for effective management of critical plant machinery: continuous online data acquisition, data capture on alarm, transient data sampling, software

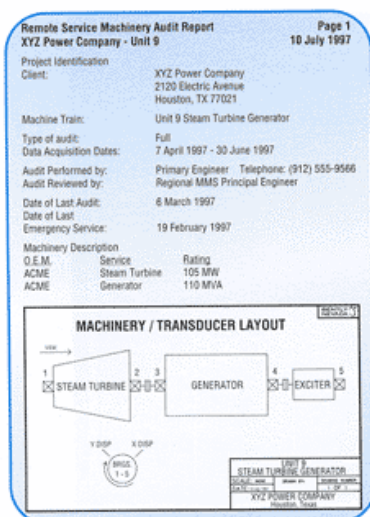


Figure 1. Machinery Audit Report.

alarms, process information correlation, and remote access.

Data Manager 2000 and other online Bently Nevada machinery management products are powerful, highly versatile systems. In order to take full advantage of this power and versatility, the Data Manager 2000 requires a fair amount of user interaction to "fine-tune" various parameters for optimum performance. As part of a Remote Service program, our MMS engineers work with customers to ensure that they get the most from their Data Manager 2000 System.

Some of the items MMS engineers assist with are:

- Fine-tuning sampling parameters, such as trend intervals, frequency spans, optional frequency components, startup and shutdown parameters, and auto upload parameters
- Setting up 1X and 2X acceptance region software alarms
- Selecting slow roll vectors
- Setting up dc gap reference data
- Baseline data collection
- Database archiving

Machinery Audits

The next step of a Remote Service program is a survey on each machine train included in the plan to establish baseline conditions. An audit report (Figure 1) is then furnished to the customer. The body of the audit contains the following information:

Machine history - A brief summary of the machine train's condition and maintenance history.

Immediate action items - Recommendations requiring immediate attention.

Conclusions - Conclusions regarding machinery condition, with supporting data.

Recommendations - Based on an analysis of machine train data, rec-

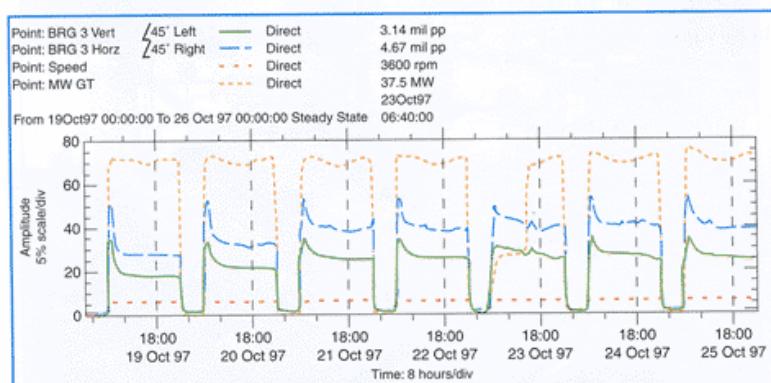


Figure 2. Data Manager 2000 multi-variable trend plot, showing bearing vibration, speed, and megawatts on a gas turbine generator.

Remote Service 3-Point Program



ommendations may include alignment, field balancing, maintenance, and modified operating procedures.

Database management - A summary of Data Manager 2000 actions, such as changes to sampling parameters, acceptance region and other software alarm setpoints, data archiving, and other items as needed.

Supplementary plots - Representative plots which present a current profile of machine condition for all points.

Follow-up machinery audits can be performed at specified time intervals, bimonthly, for example, or can be performed upon request. Follow-up audits are important for a number of reasons: compare current data with baseline data to provide an early warning of potential machine problems, correlate process data with machinery condition data (Figure 2), fine-tune sampling parameters, acceptance region software alarms, and Data Manager 2000 items as appropriate. Following mechanical work on a machine train, baseline data and software setpoints may need to be re-established.

Emergency remote service

The most visible and dramatic economic benefit of a Remote Service program is quick response in the case of an emergency - Bently Nevada MMS engineers can be reached 24-hours a day. In the United States and Canada, an 800 number is provided to customers with Remote Service programs. Consider this scenario:

During the startup following a major outage, high vibration levels

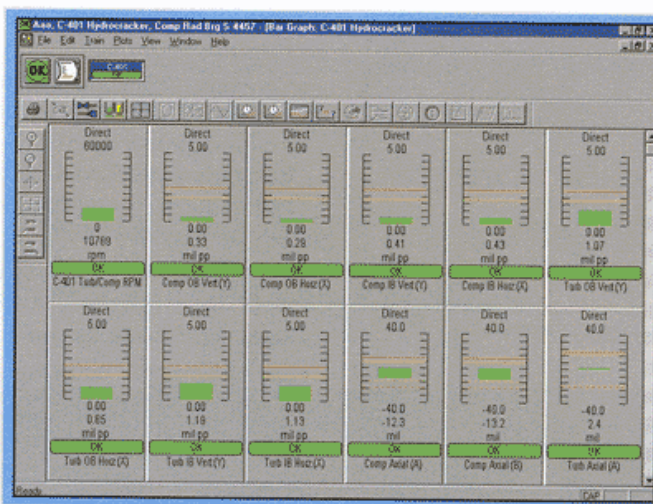
on a compressor train at a hydrocarbon processing plant activate alarms and the machine is shut down. Plant personnel can call an 800 number provided by Bently Nevada for around-the-clock emergency service coverage. An MMS engineer quickly responds and remotely accesses the Data Manager 2000 computer to analyze data *already stored* from the failed startup attempt. In less than 1 hour, the MMS engineer diagnoses coupling unbalance as the source of high vibration. The MMS engineer uses the data to calculate balance weight placements for the coupling hub to correct the unbalance. After the mechanical work to install the balance weights is completed, the machine train is re-started trouble-free, with the MMS engineer monitoring the startup via remote access.

Machinery notebooks

Occasionally, an MMS engineer, who is not familiar with a particular plant and machine train, answers an emergency call. The first thing he will do is access the electronic Machinery Notebook which is maintained by the primary MMS engineer for each machine train in the program. Important information, such as machinery nameplate and design data, transducer arrangement, machine history, and plant and MMS engineer contact information, is contained in this notebook. To protect sensitive information, only Bently Nevada MMS engineers and plant personnel have access to this notebook. Plant personnel can access a "shared" version of the notebook, stored on their Data Manager 2000 data acquisition computer, to document the latest, non-emergency information on a particular machine train.

Remote Service program in action

Tesoro Alaska Petroleum recently purchased a Bently Nevada 3500 Monitoring System and a Data



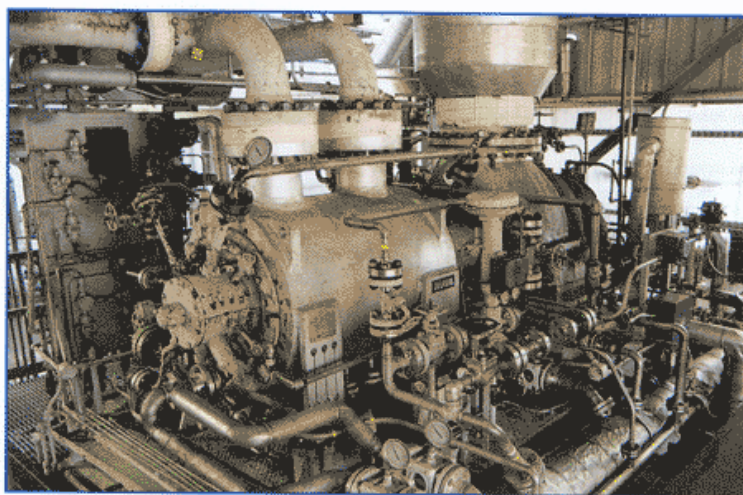
Data Manager 2000 bargraph display at Tesoro Alaska Petroleum.

Manager 2000 System for their recycle compressor. The C-401 Hydrogen Recycle Compressor is the most critical piece of rotating equipment at the refinery.

Following the installation of the new monitoring equipment and startup of the compressor train following an outage, Tesoro purchased a Remote Service program. Via remote access, Bently Nevada MMS engineers helped Tesoro fine-tune the sampling parameters and software alarms on their Data Manager 2000 for maximum performance. Machinery audits provided to Tesoro

every three months detail machine condition and Data Manager 2000 performance. Tesoro also has 24-hour remote diagnostics coverage in the case of an emergency.

With the help of Bently Nevada's MMS group, software alarm set-points, such as 1X and 2X acceptance regions, are now set and enabled. Acceptance regions are one of the tools for early detection of changes to a machine train's mechanical condition. A change in unbalance response, for example, will not always result in higher 1X amplitude, but may result in a



The C-401 Hydrogen Recycle Compressor at Tesoro Alaska Petroleum.

phase change or even a decrease in 1X amplitude. Acceptance regions, built around a normal distribution or "scatter diagram" of vectors over time, such as the 1X vectors shown in the plots (Figure 3), provide software alarms when significant changes occur.

Tesoro plans to use the periodic machinery audits provided by MMS to help them decide what mechanical work, if any, will need to be performed on their gas recycle compressor during their next scheduled outage.

Remote Service with Machine Condition Manager™ 2000

A Remote Service program is a logical fit for customers with Machine Condition Manager 2000, our online expert system for machinery management. See the Sept. 1997 Orbit article (page 22) for more information on MCM2000. With its direct link to Data Manager 2000 databases, Machine Condition Manager 2000 can provide online analysis and "actionable information" reports automatically and within minutes. Where does a Remote Service program fit in? Through a Remote Service program, Bently Nevada MMS engineers are available to help our customers *get the most* from Machine Condition Manager 2000

and Data Manager 2000, long after system commissioning is completed. MCM2000 uses data from Data Manager 2000 to provide it with the best information possible, so keeping both software packages "tuned" for optimum performance is important. MCM2000 and Data Manager 2000 data have remote access capabilities; MMS engineers can provide technical support from a remote location. A Remote Service program can be used to supplement the Machine Condition Manager 2000 in a backup capacity via 24-hour emergency service coverage.

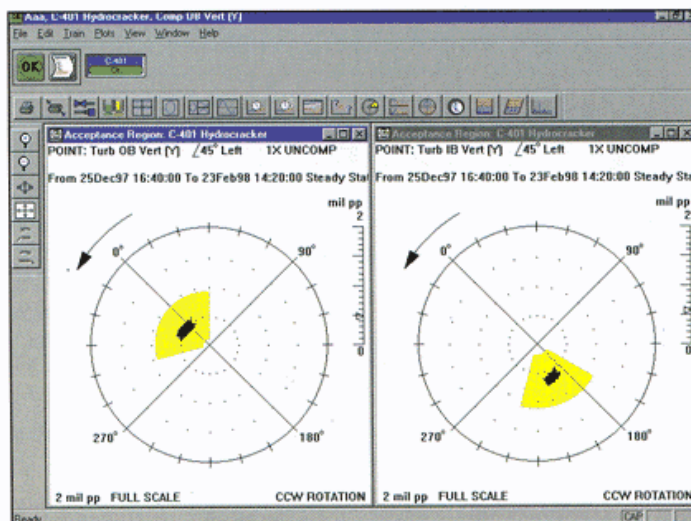


Figure 3. Data Manager 2000 1X acceptance region plots at Tesoro Alaska Petroleum.

Remote Service: put Bently Nevada's expertise to work

Bently Nevada machinery management products and services are a cost-effective way to manage valuable plant assets. By identifying and evaluating potential machinery problems early, minimizing time needed to acquire actionable information, and optimizing both the process and machinery asset life, maintenance costs and unscheduled downtime can be minimized. Bently Nevada wants to provide its customers with the best machinery management products, and the best services to support them.

In this day of remote telecommunications, we realize that face-to-face communication and on-site inspections are important, too. This is why a Bently Nevada MMS engineer will travel to your plant site to conduct an initial survey at the beginning of a Remote Service program. Remote Service programs are currently in place at a number of customer locations worldwide. Contact your nearest Bently Nevada sales representative for more information. ☺

